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Notes on Fungi. I.

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In my paper on *Peronosporeæ* (BOTANICAL GAZETTE, viii. 335), the statement was made that the Cystopus parasitic on *Convolvulaceæ* in the United States was apparently the same as the *Æcidium Ipomœæ-panduranæ* of Schweinitz, *Syn. Fung. Car. Sup.* no. 454, and a doubt was expressed as to whether it should be united with the *C. cubicus* (Strauss) Lev. which infests *Compositæ*, although the conidia of the two forms are much alike. At that date the oospores of the form on *Convolvulaceæ* had not been seen, and I suggested that they should be sought in the stems and petioles rather than in the leaves. In the autumn of 1888 I received from Prof. L. H. Pammel some very interesting specimens of swollen stems of *Ipomœa pandurata*, collected at Valley Park, near St. Louis, Mo., in which he had found the oospores in abundance, while the accompanying leaves were covered with conidia. The swellings of the stems were very striking, and in one fine specimen the tumor formed by the hypertrophied parenchyma of one side of the stem was six inches long and somewhat over an inch in diameter, while the stem itself, whose diameter was not greater than a quarter of an inch, was bent over in the form of a horse-shoe by the growth of the unilateral tumor. The surface of the tumors when fresh was continuous, but in drying they cracked open and the inner portion was exposed in numerous places. Microscopic examination showed that the oogonia were different from those of any other Cystopus known to me, since their walls were not smooth, but raised in blunt papillæ, or short flexuous ridges over their whole surface. In the younger oospores the smooth-walled antheridia were in marked contrast with the papillate oospores, and the pollinodia were larger and more prominent than in other *Peronosporeæ*, so that the present species is remarkably well adapted for the study of the fertilization in this order. The oogonia are very irregular in shape, appearing in some sections nearly triangular, and their average diameter is 45μ. The oospores are on an average about 36μ in diameter, with an endospore 3μ thick. The

exospore is thinner and yellowish-brown in color, and apparently somewhat papillate, but the markings are masked by those of the overlying oogonium wall, and as the specimens examined were not quite mature, it was difficult to free the oospores from the oogonia. The markings of the exospore are certainly much less prominent than in C. candidus.

As the oogonia and oospores differ decidedly from those of C. cubicus, called in recent works *C. Tragopogonis* (Pers.) Schroeter, the present form can not be included in that species, to which it was referred in 1874 in *Grevillea*, iii. 58, and where it is still placed in Saccardo's *Sylloge Fungorum*, vii. 234, 1888. In 1883 Zalewski in *Bot. Centralbl.*, xv. 223, under the name of *C. Convolvulaceearum* Otth, described the oospores of the Cystopus on Convolvulus Siculus in Southern France, and on C. retusus in Guadeloupe, and referred the North American form on Ipomœa Batatas to the same species, although he had not seen oospores in the latter case; and Zalewski's name was adopted by Kellerman in *Trans. Kansas Acad. Sci.* x. 94, and by Ellis in *N. A. F.* no. 1809. Being unable to ascertain where the name cited by Zalewski was originally published by Otth, I applied for information to Dr. Ed. Fischer, of Berne, who kindly informed me that there were specimens in the Otth herbarium marked *C. Convolvuli* Otth on C. Siculus from Hyères, but that he was unable to find out when or where the species was published by Otth. Probably the name of Otth is a manuscript name, and we may regard Zalewski as the proper authority for the name C. Convolvulacearum, which name is not quoted in the *Sylloge* of 1888. The description of Zalewski makes no mention of the characteristic papillate oogonia, and his account of the markings of the oospores does not agree with those seen in Prof. Pammel's specimens, but when quite mature the latter might have become more distinctly marked.

Undoubtedly the first name given to the form on *Convolvulaceæ* in North America was *Æcidium Ipomœæpandurame* Schweinitz, for an examination of an authentic specimen of Schweinitz shows that it is certainly a Cystopus identical, so far as can be told by the conidia, with the Cystopus known in this country on *Ipomœa Batatas* Lam., *I. Jalapa* Pursh., *I. pandurata* Meyer, *I. leptophylla* Torr., *I. commutata* Rœm. & Sch., *I. Nil* Roth., and *I. hederacea* Jacq. To this form is apparently also to be referred the Cystopus reported by me (Botanical Gazette, viii. 335), as growing on cotton leaves in

Alabama. The leaves were sent to me as cotton leaves, to which they bear a strong resemblance, but a microscopic examination shows that they can not be cotton leaves, but probably leaves of some Ipomœa or Convolvulus. The date of the original Schweinitzian name is 1822, which must be prior to any name of Otth, even if I am mistaken in supposing the name cited by Zalewski to be merely an herbarium name of Otth. In 1834 Schweinitz in *Syn. Fung. Am. Bor.* no. 2866 changed his original name to *Cœoma Convolvulatum*, and in *Grevillea*, iii. 60, Berkeley and Curtis enumerated *Æcidium Ipomœæ* Schw. on I. trichocarpa, the same as I. commutata mentioned above. Æcidium Ipomœæ is apparently an abbreviation of the name in the *Syn. Fung. Car.* In the *Sylloge*, vii. 671, Berlese and De Toni give Æcidium Ipomœæ-panduranæ as a synonym of *Puccinia Ipomœæ* Cke., based on the specimen in Ravenel's *Fungi Americani*, no. 792. This is an error, for the æcidium in the specimen named is certainly not the true *Æc. Ipomœæ-panduranæ* of Schweinitz, but what is called by Cooke, in *Grevillea*, xiii. 6, *Æcidium Convolvuli* Schw. var. *Ipomœæ*.

In this connection it may be said that Cystopus cubicus has been found on Matricaria at San Diego by Mrs. Eigenmann, and on Perityle Californica, var. nuda, in Lower California. The last named specimens, received from Mr. Colville, contained ripe oospores.

Last autumn I received from Mr. K. Miyabe a very interesting Peronospora, found by Mr. Y. Tanaka on Cucumis sativa in the preceding June at Minoma, Tokio, Japan. The dried material received was accompanied by some excellent drawings, showing not only the conidia, but also illustrating the germination, which was by means of zoospores. The Peronospora hitherto known on *Cucurbitaceæ* in the United States is *P. australis* Speg., *P. sicyicola* Trelease of my previous paper. In the *Sylloge Fungorum* P. australis and P. sicyicola are described separately, but there can be no doubt that they are the same species, since not only does Spegazzini's excellent description answer to our plant, but specimens which were sent to him were pronounced by him to be certainly the same as the South American plant. The germination of the conidia of P. australis has not been seen, but the pinnate branching and condensed spiny tips of the conidiophores, and the general character of the spores are so much like those of such species as P. viticola and P. Halstedii, which are known to produce zoospores, that it might be supposed that it would also produce zoospores.

The same would not have been expected in the case of the Japanese Peronospora, for its aspect is unlike that of most of the zoosporiferous forms placed by Schroeter in the genus Plasmopara. The Japanese fungus is less conspicuous to the naked eye than P. australis, and covers scattered spots on the underside of the leaves with a thin down. The conidiophores are not densely tufted in the stomata, but are either solitary or grouped in small numbers. They have an average breadth of from 4–6μ and generally reach a height of 25–30μ before they begin to branch. The ramification is typically pinnate, the branches being given off at rather a wide angle, but not at right angles as in P. viticola and P. Halstedii. The main branches are again loosely once or twice pinnate with straight, filiform, widely diverging tips. Occasionally there is an appearance of forking, owing to the exceptionally luxuriant growth of the lower branches, but the typical branching is certainly pinnate rather than dichotomous. Compared with the conidiophores of other species the present form is marked by its slender naked main axis bearing a loose tuft of branches near the tip. The spores are obtusely oval, from 21–25μ long by 15–18μ broad, 25μ by 18μ being very common. They are slightly papillate and, when mature, of a dingy violet color. Oospores were not seen by me. The species is said to occur in Japan on one other cucurbitaceous plant besides Cucumis sativus, but I am unable to give the name of the second host.

Mr. Miyabe has fortunately been able recently to examine the specimens of *Peronospora Cubensis* B. & C. in the Berkeley collection at Kew, and finds that the Japanese fungus is identical with that species. The species is interesting biologically because, as a rule, the conidial spores of those Peronosporæ which produce zoospores are small and cuboidal in shape, while the large oval and violet colored spores of the present species suggest rather species placed by de Bary in the section Pleuroblastæ. The range of the species is also interesting. Found first in Cuba by C. Wright, it has not been seen again until discovered in Japan in 1888, and during the present year in New Jersey, where it was found by Professor Halsted on cucumbers. The latter specimens agree perfectly with those from Japan, and Professor Halsted informs me that he has also been able to see the germination of the conidial spores by zoospores, thus confirming the observations made in Japan by Mr. Tanaka.

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Notes on our Hepaticæ.

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I. NORTHERN SPECIES.

In a recent address, Simon Newcomb made the prophecy that the time would come when he who made a discovery in the literature of a science would be entitled to as great recognition as he who made a discovery in nature. With the sharply defined division of labor and the elaborate systems of indexing now in use this is hardly likely to prove true in botanical science: yet we have not passed the time when the discovery of forgotten works does not produce extensive upheavals in the nomenclature of long established species and supplants names long familiar by others often less euphonious and simple. In the literature of the Hepaticæ two works, neither of which has any special merit or originality, have been the source of much contention and difference of opinion, and, in connection with the earlier works of Necker[1] and Raddi[2], really form the foundation of generic distinctions among the Hepaticæ. Copies of these works, though long sought for, have only recently come into our possession. They bear the titles: "A Natural Arrangement of British Plants," by Samuel Frederick Gray, 2 vols. London, 1821, and "Commentationes Botanicæ. Observations Botaniques par B. C. Dumortier." Tournay, 1822.

In the first named work the species of Jungermania, of which the British species had been elaborately monographed by the elder Hooker five years before[3], were placed in new genera, which, for the greater part, corresponded to the sections already indicated in Hooker's work. The genera thus established were: Riccardius, Pallavicinius, Herverus, Papa, Blasia, Maurocenius, Salviatus, Pandulphinus, Marchesinus, Cavendishia, Martinellius, Mylius, Nardius, Jungermannia, Bazzanius, Scalius, Cesius, Herbertus[4], Lippius, and Kantius. Of these Blasia had been named by Micheli[5], and adopted by Linnæus; Hooker, however, had united it with

[1] Elementa Botanica, 1790.

[2] Jungermannisgrafia Etrusca in *Atte d. Soc. Ital. d. Scienze*, XVIII, 1–45 (1818).

[3] British Jungermanniæ, 1816.

[4] In the text (vol. I, pp. 684, 705) this name is given to two entirely distinct genera; the former, however, is changed to Pallavicinius later in the volume (p. 775).

[5] Nova plantarum genera, 1729.

Jungermannia. Jungermannia was first established by Rappius[6], and being adopted by Linnæus and all subsequent writers, stands to-day as the typical genus of the order. Cavendishia was a name given for a group of plants which had been designated as Porella by Dillenius[7], and which, singularly enough, had been placed by Linnæus with the Musci: the genus in question has latterly been more commonly known under the name of Madotheca. Of the other genera Herverus, Papa, Maurocenius and Salviatus had already been named by Raddi[8] as Metzgeria, Pellia, Fossombronia and Frullania, respectively. Pandulphinus had also been named Lejeunea by Madamoiselle Libert a year before[9]. Several of Gray's genera, with the termination properly changed to the feminine form, are now adopted by most hepaticologists: among these are Pallavicinia, Mylia, Nardia, Bazzania, Scalia, Herberta, and Kantia[10]. Cesia and Lippia must yield to names previously given to genera of flowering plants. This leaves two genera, Riccardia and Martinellia, concerning which there is considerable difference of opinion, the names being adopted by some and rejected by others; a statement of the question of their adoption, which presents some interesting problems bearing on the question of priority, will be stated below.

In Dumortier's work, which covers a wide range of botanical matter, chapitre cinquieme is entitled *Essai d'une Monographie des Jongermannes*. The essential part of this essay of fourteen pages is a division of the pre-Linnæan genus Jungermania into nineteen genera, as follows: Codonia, Madotheca, Lejeunea, Phragmicoma, Jubula, Radula, Mesophylla, Jungermania, Thricbrolea, Saccogyna, Cincinnulus, Schisma, Marsupella, Mniopsis, Dilæna, Fasciola, Aneura, Scopulina, and Blasia, all of which, except Jungermania, Lejeunea and Blasia, were new. As Dumortier was ignorant of the work of either Raddi in Italy or Gray in England, he naturally duplicated several genera. Thus Madotheca = Porella Diel. Fasciola, Codonia and Scopulina are, respectively, Metzgeria, Fossombronia and Pellia of Raddi; while Dilæna, Mesophylla, Mniopsis, Schisma and Cincinnulus are the equivalents of Pallavicinia, Nardia, Scalia, Herberta, and Kantia of Gray. Jubula, although

[6]Flora Jenensis, 2d ed., 1726.

[7]Historia Muscorum, 1741.

[8]Loc. cit.

[9]In *Ann. gen. sc. Phys.* V, 372 (1820).

[10]A contribution of interest on Gray's genera, by Dr. Carrington, may be found in volume X of the Transactions of the Botanical Society, Edinburgh (1870).

originally including Raddi's species of Frullania, had for its type species *Jungermania Hutchinsiæ* Hooker, and as this is the type of a very distinct genus, properly retains this name. Phragmicoma, although preceded by Gray's Marchesinus, has stood as a genus until recently, when it has been united with Lejeunea by one of the masters in hepaticology in his recent revision[11]. The distinctive characters of Marsupella have been pointed out, and it has been re-established by the same masterly hand[12]. Thricholea (afterwards changed by Dumortier himself to Tricholea, and by Nees corrected to Trichocolea) and Saccogyna still stand as good genera. This leaves the two genera, which have been referred to already, Aneura and Radula. The case of the first is rather simple: Riccardius, established by Gray, contained three Linnæan species, viz: Jungermania multifida, J. pinguis and Riccia fluitans. Aneura, established a year later by Dumortier, contained four, viz: Jj. multifida, sinuata, pinguis and palmata. The name Riccardia, being preoccupied elsewhere, as is the earlier Candollea of Raddi, there seems little reason why Aneura should not be maintained, excluding, of course, the third species of Riccardius, which Gray, attracted by superficial resemblance, had erroneously placed here.

The other case is more complicated. Gray established the genus Martinellius, of which the first-named species was Jungermania complanata L., followed by eight others, including J. nemorosa and J. spinulosa. A year later Dumortier established the genus Radula, of which the first species was the same J. complanata L., followed by, essentially, the same species. In a later work Dumortier[13] divided this genus into three sections: 1. Radulotypus, of which complanata is the type; 2. Scapania, of which nemorosa is a type; and 3. Plagiochila, of which spinulosa is a type. Still later[14] he established the two latter sections as genera which have since been properly recognized as such, and with the advance of the study in other regions have so grown as to contain a very extensive array of species. If we are to adopt Gray's nomenclature in this case, the name Radula must certainly be displaced by Martinellia, as Dr. Carrington has well observed[15]. What then becomes of Radula, the next oldest

[11] RICHARD SPRUCE. Hepaticæ of the Amazon and of the Andes of Peru and Ecuador. Trans. and Proc. of the Bot. Society (Edinburgh) XV. (1885).

[12] Revue Bryologique, VIII, 89-104 (1881).

[13] Sylloge Jungermannidearum Europæ indigenarum, 1831.

[14] Recueil d'Observations sur les Jungermanniacées, 1835.

[15] British Hepaticæ, p. 52.

name? Shall it displace Scapania or Plagiochila? Or in a case which involves so much difficulty and can certainly disturb nothing outside of the three genera in question, is it not the part of wisdom to reject Gray's name and leave the three names so long established intact, as has been done by Spruce, Carrington, and most of the English school. In any case the adoption of Martinellia for Scapania, as done by Dr. Lindberg, is unwarranted.

The relations of these early established genera may be made more clear by the following table:

Raddi 1820	Gray 1821	Dumortier 1822	
Roemeria	=Riccardius	=*Aneura*	
	Pallavicinius	=Dilaena	=Steetzia Lehm 1846.
Metzgeria	=Herverus	=Fasciola	
Pellia	=Papa	=Scopulina	
Fossombronia	=Maurocenius	=Codonia	
Frullania	=Salviatus	=Jubula	
	Pandulphinus	=*Lejeunea* Libert 1820.	
	Marchesinus	=Phragmicoma	=*Lejeunea* Spruce
Antoirea, Bellincinia	=Cavendishia	=Madotheca	=*Porella* Dill. 1741.
Candollea	=Martinellius	=Radula	*Radula* Dum. 1835.
	Mylius	=	*Scapania* Dum. 1835.
			Plagiochila Dum. 1835.
	Nardius	=	Mesophylla, Marsupella
	Bazzanius		
		Thricholea	=*Trichocolea* Dum.
	Scalius	=Mniopsis	
	Cesius	=	=*Gymnomitrium* Nees, 1833.
	Herbertus	=	Schisma =Sendtnera Nees, 1845.
	Lippius	= *Saccogyna*	
Calypogeia=	*Kantius*	=Cincinnulus	

Since the publication of the Descriptive Catalogue[16], many changes have become necessary, some of which had escaped notice at the time of publishing that paper because of the absence of much of the scattering hepatic literature, and many more from the investigations made since its publication. In the review of the species of the "manual region" the following changes become necessary, and since necessary the sooner we become familiar with them the better:

Frullania Grayana (p. 66) becomes F. Asagrayana, the original form of the name, which has been misquoted by Americans in its shortened form, beginning with Sullivant. "Frullania Hutchinsiæ var." (p. 65) becomes *Jubula Hutch-*

[16] Underwood. Descriptive Catalogue of North American Hepaticæ, north of Mexico. In. *Bull. Ill. State Lab. Nat. Hist.* II, 1-133 (1884), to which page references are made in the corrections.

insiæ (Hook.) Dum., var. *Sullivantii* Spruce, described in full in his *Hepaticæ of the Amazon*, p. 62.

Phragmicoma clypeata (p. 73) becomes *Lejeunea clypeata* (Schw.) Sulliv., to which *L. calyculata* Tayl. (p. 69) is reduced as a synonym based on an examination of Taylor's specimen in the Gray Herbarium. L. cucullata (p. 71 not of Nees) becomes *L. diversiloba* Spruce, the true *L. cucullata* Nees being a Javan plant.

L. echinata Tayl. (p. 72) is properly *L. calcarea* Libert, as the species was originally named in 1820. The use of Taylor's name illustrates one of the pernicious principles that has been introduced into the system, and is even now maintained by some botanists. The plant was first described by Hooker in 1816 under the varietal name "Jungermannia hamatifolia *β* echinata." Madamoiselle Libert describes it as a species in 1820 as a type of her new genus Lejeunea with the specific name, "calcarea"; Taylor, in 1844, rejected Madamoiselle Libert's name and revived the varietal name of Hooker, which plainly has no claim to priority, not having been used by him as a *specific* name.

L. testudinea Tayl., *L. cyclostipa* Tayl., *L. polyphylla* Tayl. and *L. longiflora* Tayl., should all be stricken from our flora, Spruce having pointed out the fact that they are all South American species, erroneously reported from Ohio by mistakes in labels.

Madotheca (p. 74) must be replaced by the pre-Linnæan name Porella of Dillenius. It is a singular fact that the name Madotheca should have remained so long undisturbed, since Linnæus himself adopted Dillenius' name, although he erroneously placed the plant among the Musci. Our species become *P. pinnata* L. (= Madotheca porella, p. 76), *P. platyphylla* (L.) Lindb. (p. 75), *P. thuja* (Dicks.) Lindb. (p. 75), *P. rivularis* (Nees.) (p. 74), and *P. Sullivanti* (Aust.) (p. 75). Blepharozia (p. 80) returns to Ptilidium and our species is *P. ciliare* (L.) Nees. Another erroneous principle of nomenclature is here illustrated. Blepharozia was established as a sectional or subgeneric name by Dumortier in his *Sylloge*, 1831, but was not raised to generic rank until 1835; meanwhile (1835) Nees had established for the same plant the genus Ptilidium, which must stand as the first *generic* name.

Sendtnera (p. 81) becomes Herberta, as noted above, and our species is *H. adunca* (Dicks.) S. Gray.[17]

[17] Our species has erroneously been referred to *S. juniperina*, which is a much more robust species of tropical America.

Cephalozia catenulata (p. 95 *et Auct. Amer.*, not of Lindenb.) is a new species described by Spruce under the name of C. Virginiana.[18]

C. multiflora (p. 94) was erroneously described by Lindberg and corrected by Dr. Spruce:[19] it should, therefore, read *C. multiflora* Spruce, with some alteration in the specific description.

C. Francisci, var. fluitans (p. 96), becomes *C. fluitans* (Nees.) Spruce.[20]

Calypogeia (p. 85) becomes Kantia, as noted above, and our species become *K. trichomanis* (Dicks.) S. Gray, and *K. Sullivanti* (Aust.).

Trichocolea Biddlecomiæ (p. 82), imperfectly described, presents no characters in the description which merit for it a specific rank. No specimens are in existence, so far as we can find; it will, therefore, drop from the list.

Scapania compacta, var. irrigua (p. 108), becomes *S. irrigua* (Nees) Dum. *S. breviflora* Tayl. (p. 110), as seen in Taylor's own specimen and drawing in the Gray herbarium, is a synonym of S. nemorosa. S. albicans, var. taxifolia (p. 108) is removed to Diplophyllum, and its nomenclature is *D. albicans* (L.) Dum., var. *taxifolium* (Nees).

Lophocolea minor (p. 89, Aust. *Hep. Bor.-Am.* No. 65b, not of Nees), is *L. Austini* Lindb., while L. crocata (p. 90, Aust. *Hep. Bor.-Am.* No. 65, not of Nees), is the true *L. minor* Nees, as pointed out by the late Dr. Lindberg.[21]

Chiloscyphus Drummondii Tayl. (p. 88) drops out of the list as a synonym of Harpanthus scutatus. There is a strange mortality among Taylor's American species, and further study of his private collection, which now forms part of the Gray herbarium, will doubtless be a profitable work in clearing up some problems in synonymy.

Coleochila (p. 97) becomes Mylia, as noted above, and our species is *M. Taylori* (Hook.) S. Gray.

Pleuranthe olivacea (p. 90), another of Taylor's species, is *Harpanthus Flotovianus* Nees.

Jungermania polita (p. 104 Aust. *Hep. Bor.-Am.* No. 46, not of Nees) is described by Dr. Lindberg as a new species, *J. laxa* Lindb.[22]

Marsupella Dum., following Dr. Spruce, is to be sepa-

[18] Spruce: on Cephalozia, 1882, p. 37.
[19] Spruce, l. c. 37.
[20] Spruce, l. c. 50.
[21] Hepaticæ in Hibernia mense Julii, 1873, lectæ: in *Acta Soc. Scient. Fenn.* X, 503 (1875).
[22] Loc. cit. 529.

rated from Nardia (p. 113) and our species become *M. sphacelata* (Gies.) Dum. (p. 114), *M. emarginata* (Ehrh.) Dum. (p. 114) and *M. adusta* (Nees) (p. 114). Nardia, however, receives a considerable accession from Jungermania as follows: *N. hyalina* (Lyell) Carr. (p. 102), *N. crenulata* (Sm.) Lindb.[23] (p. 101), *N. crenuliformis* (Aust.) Lindb. (p. 101), *N. biformis* (Aust.) Lindb. (p. 102), and *N. fossombronioides* (Aust.) Lindb. (p. 101) the last forming a distinct subgenus.

Cesia (p. 115) is preoccupied as Cæsia (R. Br. 1810) in the Liliaceæ: hence our species must be referred to *Gymnomitrium* (Nees, 1833) and becomes *G. concinnatum* (Lightf.) Dum.

Steetzia (p. 57) becomes Pallavicinia as noted above, and our species is *P. Lyellii* (Hook.) S. Grav.

The species which since the days of Schweinitz, the father of American hepaticology, has been confused under the name of A. palmata (p. 54), is a very distinct species which has been described as *A. latifrons* Lindb.[24]

Lunularia cruciata (p. 43) was described by Micheli long before Linnæus called it Marchantia cruciata; hence it must be called *Lunularia vulgaris* Mich.[25]

Duvalia (p. 35) and Grimaldia (p. 35) form one genus as early held by Bischoff[26] and later insisted upon by Lindberg[27], who, however, reduces all to the genus *Duvalia* (Nees, 1817). As there is an earlier *Duvalia* (Haworth, 1812) the species must be placed in *Grimaldia* (Raddi, 1818). Our species of Duvalia thus becomes *Grimaldia rupestris* Lindenb.

Riccia bifurca (p. 23) is omitted, there being no probability that it is a member of our flora.

Sphærocarpus Micheli (p. 30) has a much earlier name, *S. terrestris* Mich.,[28] which must take its place in our list.

Four species are known only from their original descriptions, no specimens, so far as we are aware, existing in any American collection: these are (1) *Frullania Pennsylvanica* Stephani, (2) *Jungermania Gillmani* Aust., (3) *J. Wattiana* Aust. and (4) *Cephalozia pleniceps* (Aust.) Und. These should be specially sought by collectors in the higher latitudes. Two species must be added to our list, viz.: (1) *Frullania dilatata* (L.) Nees, and (2) *Pellia endiviæfolia* (Dicks.) Dum., which has

[23] Loc. cit. 550.

[24] Manipulus Muscorum Secundus, in *Notiser pro Fauna et Flora Fennica*, XIII. 372 (1874).

[25] Micheli, loc. cit. 4, tab. 4.

[26] Bemerkungen über die Lebermoose, in *Acta Acad. Cæs. Leop.* XVII, 1025 (1835).

[27] Musci Novi Scandinavici, 285.

[28] Micheli, loc. cit. 4, tab. 3.

hitherto been confused with P. epiphylla. Both of these are well known European species. This brings the flora of the "Manual region" to 140 species, which, as compared with the former publication in Gray's Manual by Sullivant, is an increase of 31 species. It should be noted, however, that from Sullivant's enumeration should be deducted: (1) those species which were then erroneously accredited to our district (5 species); (2) species included which have since been reduced to synonyms (8 species); and (3) species included in his list which were beyond the limits of the "Manual region" (13 species). After making these legitimate deductions, the ratio stands 83 to 140, which represents a fair advance when we consider the few who have studied or collected hepatics in America during the last twenty-six years.[29]

From Canada and the other British provinces are a considerable number of additions to report, due chiefly to the untiring energy of Prof. John Macoun. We wait the publication of these by their collector. We are now at work on a revision of the Pacific species, while a considerable number of additions collected in Florida by Capt. Donnell Smith, several years ago, have been generously placed at our disposal for study and will be examined at an early day. Two rare Southern species, *Riccia Donnelliia* Aust. and *Thallocarpus Curtisii* Aust., will be distributed in the next issue of *Hepaticæ Americanæ* through the generosity of Dr. N. L. Britton, of Columbia College. Working, as time has permitted, almost alone for the past eight years, with almost no one who would or could collect in remote parts of the country, the study has at times been very discouraging. But times have changed; collectors are more abundant, and collect more intelligently; collections come to hand faster than the crowded leisure time of a busy professional life will serve to examine; but that there is an "awakening" in the study of these neglected plants, is a ground for hope for the future. There is as yet only a beginning made; the field is large enough for any number of workers.

Syracuse University.

[29] The "4th Revised edition" of Gray's Manual on our table containing Sullivant's *Mosses and Hepaticæ of the Eastern United States* bears the date, March 10, 1863.

BRIEFER ARTICLES.

Studies in nuclear division.—It may not be generally known that nuclear division, in certain cases at least, may be easily and quickly studied, and a few hints here may not be out of place.

The readiest means of studying this interesting subject is probably to be found in the final divisions of the pollen mother-cells, especially of monocotyledons. I examined a number of plants recently, and among them found two in particular that showed very beautifully all of the stages in the division of the nucleus, including the longitudinal division of the nuclear segments[1], and were thoroughly typical representatives of the differences in the processes as found in monocotyledons and dicotyledons.

The first of these was Allium Canadense, the second Podophyllum peltatum.

Young buds must be used, in Allium about 2mm. in length; in Podophyllum buds were gathered as soon as the plants appeared above ground. In the former case the young anthers were crushed carefully in a drop of acetic acid and water (½ acetic acid and ½ distilled water). With Podophyllum cross-sections of the whole bud were made, and the sections of the anthers teased out in the same solution as in the case of Allium. The pollen mother-cells are at once recognizable by their thick colorless walls, and it is easy to tell with a low power whether or not the desired division stages are present. If this is the case they may be stained with acetic methyl-green, or better, gentian-violet. In preparing the latter the best results were had by first mixing two parts of distilled water and one of acetic acid. To this mixture a sufficient quantity of a saturated alcoholic solution of gentian-violet was added to give it a deep violet color. If a small drop of this mixture is now added to the preparation containing the pollen cells, the nuclei will be almost instantly colored a deep blue-purple, while the protoplasm remains colorless and entirely uncontracted. The coloring fluid may now be carefully removed with blotting-paper, care being taken, of course, to avoid removing any more of the floating pollen mother-cells than is necessary, and the preparation mounted in dilute glycerine, which must be added very gradually to avoid contraction of the protoplasm. Specimens prepared in this way, especially when first made, show all the finest details of the nuclear structure, and scarcely, if at all, inferior to those prepared by the much more tedious and uncertain methods of fixing by alcohol, chromic or picric acid, etc., staining with hæmatoxylon, carmine or safranin, and mounting in balsam.—DOUGLAS H. CAMPBELL, *Bloomington, Ind.*

[1]The author expects later to publish a more extended account, with figures, of these two plants, with possibly some additional matter bearing on the subject.

Some notes on Hypericum.—In the BOTANICAL GAZETTE for April and May, 1886, was published my revision of North American Hypericaceæ: while in the number for October, 1886, were published further notes and a description of a new species, *H. lobocarpum* Gattinger, from the "oak-barrens" of W. Tennessee and probably W. Mississippi. A few additional notes are made at this time to record our present knowledge of this group.

The interesting new species H. lobocarpum was found growing abundantly near Lake Charles, Louisiana, in July and August, 1888, by Prof. W. W. Daves. The range of this species is therefore extended over the Lower Mississippi region, from Tennessee southward. It should be looked for in E. Arkansas.

I am informed by Dr. Watson that during Dr. Gray's last visit to Paris, in 1887, he re-examined the types of Hypericum there, and states positively that Lamarck's H. cistifolium is neither *H. opacum* Torr. & Gray, as he first thought, nor *H. nudiflorum* Michx., as I considered it in the revision, but *H. sphærocarpum* Michx. Therefore *H. sphærocarpum* Michx. must become *H. cistifolium* Lam., and H. cistifolium of my revision, not Lamarck, becomes again *H. nudiflorum* Michx.

Another correction may as well be made. Under *H. opacum* Torr. & Gray, in the revision, H. cistifolium is quoted as a synonym, with the authority "Watson, Bibl. Index. Polypet. 125, not Lam." This authority should be changed so as to read "Torr. & Gray, Fl. i. 674, and later authors not Lam."—JOHN M. COULTER, *Crawfordsville, Ind.*

Sterility of violets.—It is a curious fact that with the remarkable arrangements for cross-pollination in numerous species of violets they rarely cross-fertilize. In order to assure myself of this conclusion, I removed a number to my garden several years ago. I have V. sagittata, V. pedata, var. bicolor, V. striata, V. Canadensis, V. palmata, var. cucullata, under observation, and, with the exception of one plant of the latter, I have never had a petaliferous flower bear seed. This one was growing on a very dry rockery. They all bear fruit abundantly from cleistogene flowers. The perfect flowers, on my grounds, are not cross-fertilized by insect or any other agency. They are not fertilized at all. Though environment (whatever that may mean) has undoubted influence on determining the development and functional powers of stamens and pistils, I incline to the belief that the same facts will be found generally elsewhere.—THOMAS MEEHAN, *Germantown, Penn.*

Dionæa muscipula.—I have had under observation a flowering plant of *Dionæa muscipula* Ellis, and the following notes may be of interest: Of the seven flowers of the irregular umbel, the uppermost opened first. The ten stamens were mature and copiously discharging pollen, while the style was small, and leaning towards one side, the stigmas undeveloped. Thirty-six hours later the fringed stigmas unfolded, and spread

out to receive pollen. This was repeated in the case of each flower, the time varying slightly. The flowers remain open three days, unaffected by light or shade; then the pure white petals begin to roll up like a scroll from the outermost edge inwards, inclosing the five stamens which grow opposite the petals, and leaving the others, which are opposite the sepals, still exposed. After a time, the sepals fold inwards over the fertilized ovary. The pollen is (as in the Heath family) compound, composed of four united grains, each one having spine-like projections, and showing thin oval spots on the surface. I cross fertilized the flowers, and they give evidence of bearing seed.—CONSTANCE G. DUBOIS, *Waterbury, Conn.*

Observations upon barberry flowers. — In the common barberry (*Berberis vulgaris* L.) the anthers of the sensitive stamens dehisce by means of uplifted valves in such a manner that the pollen adhering to the inner surface of the valve (now turned inward) is brought against the rim of the large discoid stigma when the stamen is irritated. This position is secured by the valvular suture extending to the top upon the outside of the stamen (the whole valve being lateral), then by contraction the valve is folded inward and upward and the inner surface loaded with pollen is brought facing the pistil.

An examination of the stigma shows that there is a narrow belt of long stiff hairs surrounding the whole rim of the cup-shaped stigma. These hairs are abundantly provided with an adhesive substance, and the cushion or belt of hairs occupies that portion of the top of the style against which the anthers come when they bevel inward, and in an ordinary flower this zone is soon covered over with adhering pollen. All of the upper surface of the discoid stigma is covered with short papillæ as is also the deep cleft which extends downward into the style. In the examination of a large number of stigmas not a single pollen grain was found germinated in the brush of hairs, but above this, and of course at a point out of reach of the stamens of that flower, pollen tubes were not infrequent.

Paper sacks were placed upon branches bearing racemes of unopened flowers, and all insects thereby excluded. The blossoms were examined from time to time, and in all cases the pollen was abundant upon the brush, but none could be seen upon the stigma proper. Out of thirty racemes thus covered only four formed any fruit, and three of these berries were upon a branch over which the sack was defective, having a hole at the top. The other case may be a case of close fertilization, or an insect possibly worked its way into the sack from its base, where it might have been imperfectly folded around the stem. The flowers not covered by sacks upon neighboring branches or shrubs fruited heavily. The observations with microscope and the actual field experiments suggest that the brush is only a means for wide fertilization.—BYRON D. HALSTED, *New Brunswick, N. J.*

Notes upon Lithospermum.—The Hoary puccoon (*Lithospermum canescens* Lehm.) is a common prairie plant of high ground, flowering conspicuously in the month of May. This species is decidedly dimorphic, as has been previously observed by Dr. Bessey, and may be occasionally trimorphic, as reported by Mr. Smith, of Michigan. I have seen no indications of this last condition.

The styles of the long-styled flowers are from 6 to 11 mm., averaging 7.7 mm. Stamens in the same flowers are 3 to 4 mm., averaging 3.4 mm. above the receptacle. In the short-styled flowers the styles are 2 to 4 mm., averaging 2.9 mm.; and the stamens 7 to 8 mm., averaging 7.6 mm. The long or high stamens have short filaments $\frac{1}{2}$ to $\frac{1}{3}$ mm. long, attaching the anther to the corolla tube, while the short or low stamens are practically sessile.

It is, however, to the pollen of this plant that attention is called. That of the high stamens ranges from 11–13 by 22–25μ, with an average of 12 by 24μ. That of the short stamens varies frem 7–10 by 15–21μ, and averaging 8 by 17.5μ, or about two-thirds of the diameter of that of the high stamens.

The measurements are not easily taken owing to the peculiar shape of the grains, which consist of two large portions connected by an isthmus, the whole being somewhat dumb-bell shaped, with one end larger than the other. In fact the outlines made upon white paper by using the camera might be easily mistaken for representations of boot tracks in the snow.

Upon making comparative tests for germinative power, it was found that after a given period in sugar solution about one in fifty of the short-stamen grains had pushed out tubes of a length not exceeding the longer diameter of the grain. During the same time, twice as many of the larger grains produced tubes some of which were ten times the longer diameter of the pollen.

The tubes of the pollen from the high anthers need to grow through a longer distance of style and this may be sufficient reason for the greater vigor of each germinating grain, but the reason for the larger percentage of tube-producing grains may not be so apparent. It may be true that the difference in size in grains might render the same strength of sugar solution unequally favorable for growth.

Turning to the stigmas, there is a corresponding difference between those of the two lengths of styles. That of the long styles is 25 per cent. larger than of the short, and the papillæ of its surface are about twice as long.

Considerable attention was given to a corresponding study of another prairie puccoon, namely, Lithospermum angustifolium. I was not able to satisfy myself that the latter is distinctly dimorphic. There was a great variation in the lengths of the styles and stamens, but the age of the flower seemed to have much to do with this. The tube of the corolla elongates rapidly at the time when the lobes are spreading and the

growth carries the stamens upward. In the bud the style is uniformly longer than the stamens, but later on it may be equal to or shorter.

The pollen of this species is large and spherical, 47–50μ, with several prominent pores. There was no marked difference found between the grains from stamens of various lengths. There was also no evident difference between the stigma of the pistil with styles of various heights.

The remarkable difference between the pollen of the two Lithospermums may have its value in classification. In no other instance have I observed such wide dissimilarities in size, shape and markings within the same genus. As a rule, the pollen of a genus follows the same type with slight variations, except possibly in the matter of size. The differences might be termed generic, and in the proper classification the L. angustifolium may well be separated from the genus containing the L. canescens—in fact this is done in De Candolle's Prodromus, where the L. angustifolium is one of the species constituting the genus Pentalophus. —BYRON D. HALSTED, *Rutgers College, New Brunswick, N. J.*

CURRENT LITERATURE.

The genus Carex.

No genus is more severely let alone by the average botanist than this huge group of sedges. Our North American species have long been studied by Prof. L. H. Bailey, and his views have been set forth in a series of papers, published mostly in this journal, and in his monograph, which appeared among the *Proc. Amer. Acad.* publications for 1886. We have before us his latest contribution[1] to this subject, after having had the opportunity of seeing all the existing types of our North American species. This has been so thoroughly done, that almost every name which has been applied to N. Am. species is accounted for. This necessitates very many changes, more than one likes to see, but they seem necessary, and presently the new names will be just as familiar as the old. It is impossible to pass an opinion off hand upon a work of this kind, for a critic must have all the facts before him before his opinion is worth anything. It is often injustice to a monographer to pass judgment too hastily upon his work, for his opinions are the result of long and patient study, while a flippant criticism is entirely unembarrassed by facts. Therefore, the best test of such a work as that of Professor Bailey is its wearing power. It would be impossible in this brief notice to mention even the principal changes in nomenclature. In this connection the Torrey Botanical Club should be congratulated upon the appearance of this initial number of its proposed series of memoirs. It is a movement in the right direction, and should be encouraged by the hearty support of American botanists.

[1] BAILEY, L. H.—Studies of the types of various species of the genus Carex. Memoirs of the Torr. Bot. Club, Vol. I, No. 1. pp. 85. Issued May 25, 1889. Price $1.00.

Cryptogamic Botany.

Although it is true that "no general handbook to cryptogamic botany has appeared in the English language since the Rev. M. J. Berkeley's, in 1857," as Bennett and Murray remark in the first sentence of the introduction to their new text-book, yet the subject has received good treatment in several general works both by English authors and through translations. A new text-book devoted exclusively to this section of systematic botany must therefore show itself superior to what is already published, in other ways than having a separate binding, in order to be fully acceptable. There is no doubt that the new "Handbook of Cryptogamic Botany" by Bennett & Murray[2] presents the subject in the main in accordance with the latest views and in convenient compass for the use of students. In attempting to cover the whole ground uniformly, the authors have scarcely escaped the tediousness of a bare enumeration of facts. The facts can be relied upon, however, as judiciously collated directly from authoritative sources.

The subject is subdivided as follows: (1) Vascular Cryptogams, (2) Muscineæ, (3) Characeæ, (4) Algæ, (5) Fungi, (6) Mycetozoa, (7) Protophyta, the last including diatoms and bacteria. This is not a classification that a majority of advanced systematists are likely to favor, particularly as to the separation of the algæ and fungi into distinct groups. It is well that the myxomycetes should not masquerade as fungi; but it is difficult to see why the bacteria are not equally entitled to autonomy, instead of being thrust among the protophytes as the only non-chlorophyllous members of that group. If the classification of the thallophytes adopted by the authors is one for convenience, it invites little criticism, but if it is to show relationship, there are as many inconsistencies in it, to say the least, as in that of Sachs, which most later works have adopted.

We can not but think that the authors are unfortunate in their attempts to improve the commonly accepted terminology. Not until botanists make a serious attempt to anglicize such names as geranium, petunia and gladiolus into *gerane*, *petuny* and *gladiol* is it likely that they will adopt *sclerote*, *epiderm* and *antherid* for sclerotium, epidermis and antheridium. But if one is to adopt changes of this kind in order to simplify technical language, why not be consistent and use *prothal* for prothallus and *sore* for sorus? Other considerable changes in accepted usage are the use of the term *sperm* and its combinations for the sexually produced spore, and the restriction of the meaning of reproduction.

Aside from the strictures noted we have only praise for the work. It is an excellent epitome of present knowledge on the subject, with many references to the principal original publications, numerous fine illustrations, and the right kind of paper, typography and binding. Many of the illustrations will be familiar to students of Sachs' and de Bary's works,

[2] BENNETT, ALFRED W., and MURRAY, GEORGE.—A handbook of cryptogamic botany. pp. 473; 378 illustrations. 8vo. London: Longmans, Green & Co., 1889.

and some would appear to belong to the former which are not so accredited.

Physiology of tannin.[3]

Concerning no substance found in such quantity in plants has our knowledge remained so long so defective as in regard to tannin. This is largely due presumably to the rare combination of botanical knowlege with the skill of the analytical chemist. Most botanists who have studied it have used microchemical methods, and most chemists who have given it any attention have paid little heed to its functions or origin in the plant. The unsatisfactory state of our knowledge can be discovered by consulting any, even the most recent, of our text-books. After considerable study with microchemical methods, Dr. Kraus, of Halle, undertook a thorough comparative study of the origin and behavior of tannin, using the most approved methods of the quantitative chemist for determining its presence and amount. These were chiefly the Schröder-Löwenthal method of titration with chamæleon, and Fleck's method of precipitation with neutral cupric acetate, ignition, and weighing as CuO. The former method, while not indicating the total amount present, is nevertheless suitable for comparative studies. Kraus's chief conclusions are as follows:

Tannin is formed in green leaves under conditions which coincide closely, though not exactly, with those of assimilation. Tannin is not, however, a product of assimilation of carbon, for this process can and does go on independently. Tannin once formed does not undergo chemical alterations, but is carried out of the leaves along the veins and petiole to places of storage. In woody twigs it descends chiefly or only in the bark. This descent begins with the unfolding of the leaves and continues late in the growing season. The tannin of germinating rhizomes even though a large portion of their weight (25-40 per cent.) disappears to form the new organs, does not diminish in quantity. On the contrary, it may increase. All the new organs contain tannin, which must therefore be formed in the darkness. Neither in woody plants nor in seeds does tannin behave as a reserve stuff.

After discussing the two modes of formation of tannin indicated above, the author gives an account of its anatomical relations, treating (a) of the transitory tannin, the green tissues in which it is formed, the conducting and storage tissues, and (b) of the autochthonous or resting tannin in growing-points, tannin-sacs, etc. The tannin of galls he calls, provisionally, autochthonous. Chapters on the methods of research and a sketch of previous investigations are followed by the details of his experiments, covering 52 pages.

It strikes us that the author is rather inclined to depreciate or ignore the labors of previous investigators, and that his assumption that he

[3] KRAUS, GREGOR.—Grundlinien zur Physiologie des Gerbstoffs. pp. vi. 131. 8°. Leipzig: W. Engelmann. 1889. M. 3.

starts *de novo* is rather too sweeping. It is true that conclusions founded on microchemical methods are not so well based as those on quantitative determinations. It is also true that when the conclusions of other investigators coincide with his own, Kraus should cite these with due credit, which he too often fails to do. In this work, however, we have a firm point of departure, and with these well sketched "Grundlinien" it is to be hoped that the additions will be rapid until we can have the work with the title, Physiologie des Gerbstoffs.

Minor Notices.

THAT MAGNIFICENT publication, *Die natürlichen Pflanzenfamilien*, has just completed III Teil, 1. Abteilung b, in six parts. It contains Phytolaccaceæ, and Nyctaginaceæ by A. Heimerl, and Aizoaceæ, Portulacaceæ, and Caryophyllaceæ by F. Pax. The chief changes among North American Nyctaginaceæ are that Oxybaphus is included under Mirabilis, and Pentacrophys under Acleisanthes. The name Aizoaceæ may sound strange, but it stands for our Ficoideæ. Our genera of Portulacaceæ stand as usual, but in Caryophyllaceæ the changes are numerous and radical. In the first place, the Illebraceæ are brought back. Lychnis seems to disappear from our native flora, our species being divided among Agrostemma, Melandryum, Viscaria, etc. For instance, *Lychnis Githago* Lam. becomes *Agrostemma Githago* L., *L. apetala* L. is *Melandryum apetalum* Fenzl., and *L. alpina* L. is *Viscaria alpina* Fr. What becomes of all of them is hard to find out. Mœhringia is restored to generic rank, and another Arenaria, *A. physodes* DC., becomes *Merckia physodes* Fisch. *Tissa* Adans. replaces Lepigonum or Spergularia, as followed by Dr. Britton in *Bulletin of Torr. Club* (May). It will be a task interesting to some of our botanists now to reconstruct our specific names on this new basis.

A REVISION of North American Rhamnaceæ has just been published by Dr. Wm. Trelease, being a reprint from the *Trans. St. Louis Acad. Sci.*, Vol. V, No. 3. The order contains 12 North American genera, and the following changes from Watson's Bibl. Index are noted: Scutia disappears, *S. ferrea* Brogn., becoming *Condalia ferrea* Griseb.; *C. Mexicana* Schl. is added from Arizona; *Reynosia latifolia* Griseb. is added from S. Florida; *Rhamnus Insulus* Kellogg, is included under *R. crocea* Nutt.; *Sageretia Wrightii* Watson is added from New Mexico and Texas; *Colubrina reclinata* Brogn, is added from S. Florida.

VOLUME I., Part 6, of *Pittonia* (March–May, 1889), has an interesting table of contents. This part completes the volume, which is suitably indexed. The amount of botanical work represented by this first volume may be inferred when it is known to contain 6 new genera, 180 new species, and 3 new varieties. This does not include the numerous transferred species. The present part contains the following papers: Vege-

tation of the San Benito islands; Supplementary list of Cedros island plants; Concerning some Californian Umbelliferæ; Botanical nomenclature in N. Am.; Baron Mueller on early binomials; New or noteworthy species, IV; Plants from the bay of San Bartolomé; Analogies and affinities, I; New or noteworthy species, V; Reminiscences of Major J. E. LeConte. All these papers are from the pen of Professor Greene, excepting the last, which is by Mary Graham.

ANOTHER CONTRIBUTION to local botany comes to us in the list of the flora of Lorain county, Ohio.[4] It is a bare list, without notes on distribution, locality or abundance, omissions which are explained by the designation "preliminary." It is well printed, in such a way as to leave space for the notes which will need to be inserted as the data for a complete catalogue are obtained, and is accompanied by an excellent detailed map of the county. The nomenclature conforms to that of the revised Manual which is soon to appear.

NOTES AND NEWS.

TORREYA CALIFORNICA is figured in *Gardener's Chronicle* of June 29.

EDWARD GILLETT, Southwick, Mass., desires a large number of the roots of Dodecatheon Meadia.

MR. H. H. RUSBY has been appointed Professor of Botany and Materia Medica in the New York College of Pharmacy.

MR. T. S. BRANDEGEE, a well-known western botanist, has been married to Mrs. Mary Curran, the botanical curator of the California Academy of Science.

A BEAUTIFUL mountain meadow on Mount Rainier, covered with Erigeron salsuginosus in bloom, is reproduced in *Garden and Forest* (July 3) from a photograph.

REV. THOMAS MORONG, now traveling in the Argentine Republic, has written a short series of articles for *The Standard* of Buenos Ayres, on the Paraguayan flora, chiefly with reference to forage plants.

A HYBRID Catalpa is described and figured in *Garden and Forest* (June 26) by Professor Sargent. It is thought to be a hybrid from C. Kæmpferi, the Japanese species, and one of the American species, C. bignonioides or C. speciosa, probably the former.

THE GOLD MEDAL of the Linnæan Society has been awarded this year to Professor Alphonse DeCandolle, in recognition of his important services to botany. The gift was received by his grandson, a fourth representative of a very distinguished line of botanists.

[4] WRIGHT, ALBERT A.—Preliminary List of the flowering and fern-plants of Lorain county, Ohio. Map. 8°. Oberlin, O.: E. J. Goodrich. 1889.

PROFESSOR EDWARD L. GREENE has been botanizing during June and July in California, Arizona, Colorado, Wyoming and Idaho. The first part of August is to be given to Montana, and the last of the month to Washington.

CLAYTONIA CHAMISSONIS Esch. has been found in abundance in Minnesota by Prof. John M. Holzinger. It is described as growing in a wooded ravine west of Queen's Bluff, about twenty miles below Winona. The occurrence of this western mountain species so far east is an interesting discovery.

HOW SHOULD the names of the classes and orders of the Linnean sexual system be pronounced? Prof. Th. Fries says that, as this is a vexed question, it is of interest to know that Linnæus and his pupils accented the penult (Monandría, Didynamía, Monogynía, etc.), and that this practice continued in Sweden until the last decade.

ANOTHER plant disease, the third surely attributable to the attack of bacteria, is described by M. Ed. Prillieux in the *Revue generale de Botanique* for June (p. 293). The disease appears on the twigs and larger branches of the olive and Aleppo pine in the form of tumors of varying size. The disease seriously affects the cultivation of the former tree.

PROF. C. S. SARGENT begins in the number of *Garden and Forest* for July 17 a series of papers entitled "Notes upon some North American Trees," in which he discusses points of nomenclature and offers other critical remarks on these plants. This series, as well as much else of the contents of this journal, will be found of value to systematic botanists.

AN INTERESTING fossil plant from the Upper Devonian of Wyoming county, Penn., is described and figured by Sir Wm. Dawson in *Am. Jour. Sci.* (July). It combines the fructification of the *Cordaites* with the somewhat netted veined leaves of *Noggerathia*, thus connecting two groups of paleozoic plants. It is by such discoveries that paleobotanists hope to read the riddle of the palæozoic flora.

THE RECENT BULLETINS from the Agricultural Experiment Stations are as follows: *Illinois*, Grasses and Clovers, effect of ripeness on yield and composition, Thomas F. Hunt; *Iowa*, Sorghum, G. E. Patrick; *Kansas*, Sorghum blight, Hackberry knot, Cross-fertilization of corn, Germination of weed seeds, W. A. Kellerman and W. T. Swingle; *Michigan*, Chemical composition of cornstalks, hay and screenings, R. C. Kedzie.

F. GRAVET notes (*Revue Bryologique*) that the red and yellow hues of the leaves of the Sphagna appear only when the plants grow in exposed places where they receive direct sunlight, and that these colors are due to the presence of tannin, as shown by microchemical tests with sulphate of iron and bichromate of potassium. In a very puzzling way, however, the same colors under the reagents appear in the male branches and capsules of green-leaved forms.

In some "remarks on the color reactions and the aldehyde nature of wood,"[1] Dr. Emil Nickel contends that the reactions of anilin sulphate, phloroglucin, etc., are not due to the vanillin in the lignified walls, as has long been believed, but that the woody wall itself reacts to these substances as do the aromatic aldehydes and allied bodies. He has shown that vanillin does not approach wood in sensitiveness to the "lignin reagents." Investigations in this direction may shed light on the obscure nature of "lignification."

E. R. Trautvetter has willed his herbarium, which is exceedingly rich in Russian plants, to the Herbarium of the Royal Botanic Garden at St. Petersburg. This is most fitting, for it puts these plants in the place where they will be of the most benefit to those who will need them most. It is in striking contrast with the disposition which the late H. G. Reichenbach made of his collection of Orchids, and which all botanists unite in condemning. Reichenbach has been for years the most indefatigable student of this group, and has described a great many new species, whose types are chiefly confined to his own collection. By the terms of his will this collection goes to the Imperial Hof Museum at Vienna, where it is to be *kept sealed for twenty five years!*

The gigantic Sumatran Aroid, discovered by Dr. Beccari in 1878, and transplanted to Kew Garden, has at last concluded to bloom. It is a veritable Titan, bearing the name *Amorphophallus Titanum* Beccari. The tuber is 5 feet in circumference; the solitary leaf stalk 10 feet high; the leaf 45 feet in circumference; the scape 19 inches high; the spathe 3 feet in diameter; and the spadix nearly 6 feet long. The smell from this huge inflorescence is almost overpowering, but lasts only about two days. It is said to be like that of "rotten fish, but of an intensity unspeakable." The plant was at its best for so short a time, that all the study arranged for could not be carried out, but the monster is now fairly well known so far as its outward appearance goes.

Kny's recent researches on the formation of periderm in tubers over the surface of wounds have led him to the following conclusions: 1. The cell-divisions which produce the periderm cells proceed most rapidly in an atmosphere of medium humidity. 2. In chlorophyll-free tubers light does not influence them. 3. Tubers which were kept for twenty-five days previous to the experiment at a temperature of 6–7°C. formed periderm more slowly than similar ones which were kept for the same time at a temperature of 18–21°C. 4. The position of the wound has no influence. 5. Free oxygen is necessary not only for the beginning of the cell-divisions, but also for the suberization of the membranes. In these experiments the tubers of Solanum, Inula, Gloxinia, Begonia, Dahlia, Gladiolus, Maranta, Tradescantia and other genera were used.[2]

[1] Bot. Centralblatt, xxxviii. 753.

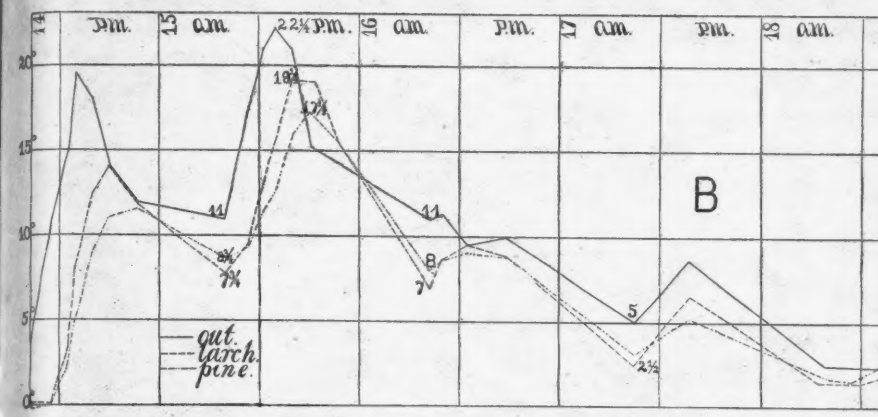
[2] See Berichte d. D. bot. Gessells. vii. 154.

THE AMERICAN ASSOCIATION meets in Toronto August 27. The Botanical Club will hold a meeting on the same day in the room of Section F, University Buildings. The President of the club is Prof. T. J. Burrill, Champaign, Ill. Communications should be sent to the Secretary, Douglas H. Campbell, 91 Alfred street, Detroit, Mich. The Vice-President of Section F is Dr. George L. Goodale. A large attendance of botanists is expected, and no pleasanter place of meeting than Toronto can be found.

THE WILL of the late Professor Reichenbach is about the most astonishing thing in botanical history. It seals up an enormous amount of orchid material that the botanical fraternity had a right to expect would be open for study. The herbarium and library go to the Imperial Hof Museum in Vienna, "under the condition that the preserved orchids and drawings of orchids shall not be exhibited before twenty-five years from the date of my death have elapsed." This is "in order that the inevitable destruction of the costly collection, resulting from the present craze for orchids, may be avoided." The Imperial Hof Museum has accepted the trust.

A "NATIONAL FLOWER" seems to be wanted, something to stir up our patriotic feeling like the flag and the eagle. The public press has gone to work in a cold-blooded way to put the thing to a popular vote, with very small chance of being decided. A national flower must come from the accident of some association, or it will never arouse the feeblest emotion. About the best suggestion from the artistic standpoint comes from M. G. VanRensselaer in *Garden and Forest* (July 10), who favors the mountain laurel (Kalmia), and argues for it well. If utility, along with beauty, can be taken into the count, what more characteristic and widely known American plant than Indian corn? It can be "conventionalized" to heart's content, and furnishes both food and drink—to many.

PROF. JOSEPH BORNMUELLER, director of the Botanical Garden at Belgrade, Servia, has started for a twelve months journey through Asia Minor. Beginning at Amasia, he will travel through the country between the course of the Kisil Irmak, Euphrates, south to the completely unexplored Mountains Ak-dagh. This territory has only once been explored, thirty-five years ago, by the Russian botanist, Wiedemann, and not diligently by any means. Prof. Bornmueller is a young and very successful explorer, with a great deal of experience, especially from his long journey in 1886, through Dalmatia, Montenegro, Greece, Turkey, East Bulgaria and Asia Minor. His original collection will be transferred to Weimar, where Prof. Haussknecht will devote his time to the scientific sorting of the specimens. The latter will be prepared in the most careful manner, and he will be able to accept a few more orders for duplicates. Museums, herbariums, or private persons, desiring a collection are asked to address themselves to George Hansen, Agr. Exp. Station, Jackson, Amador county, California.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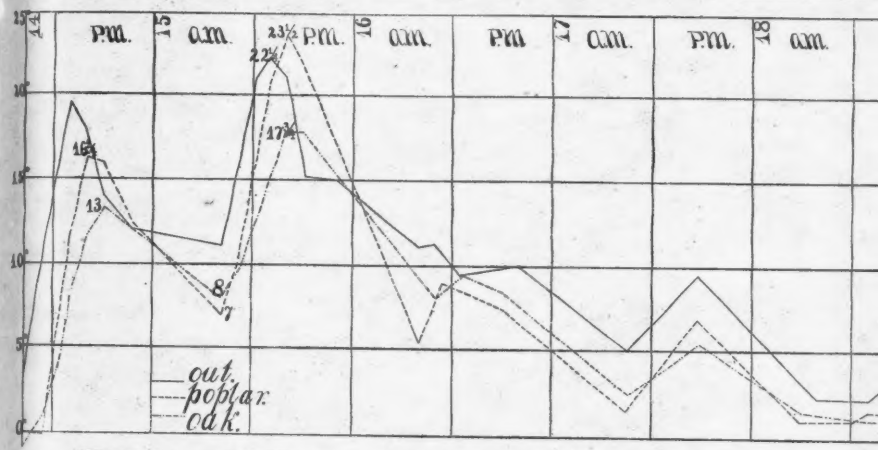
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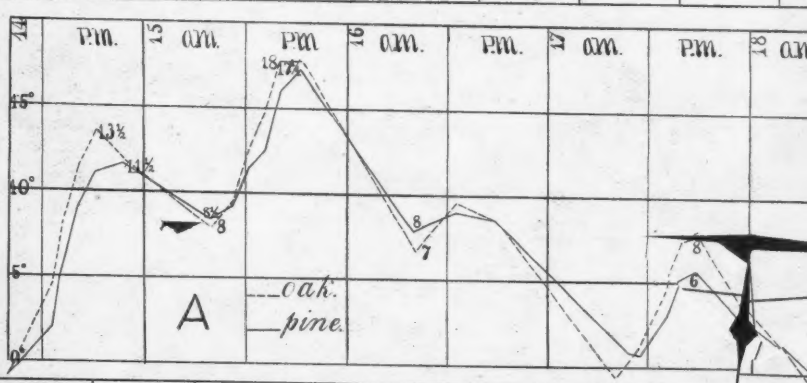
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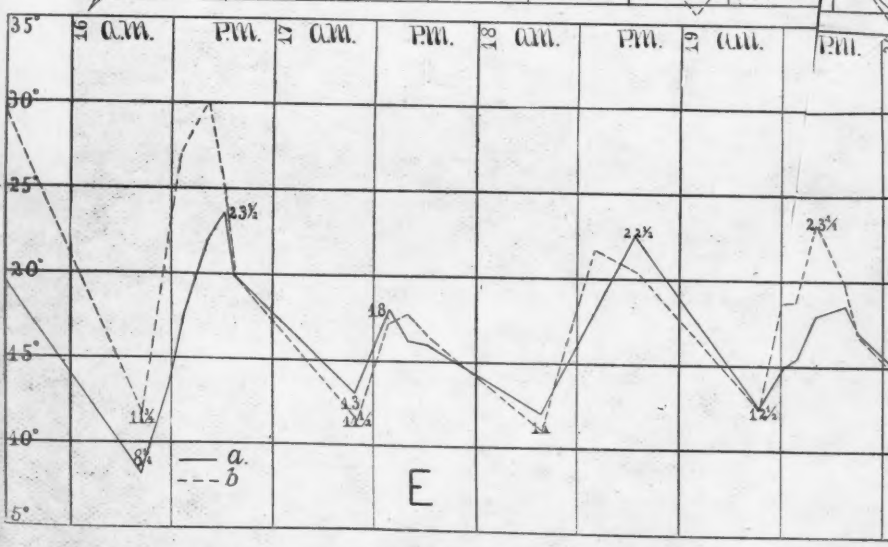
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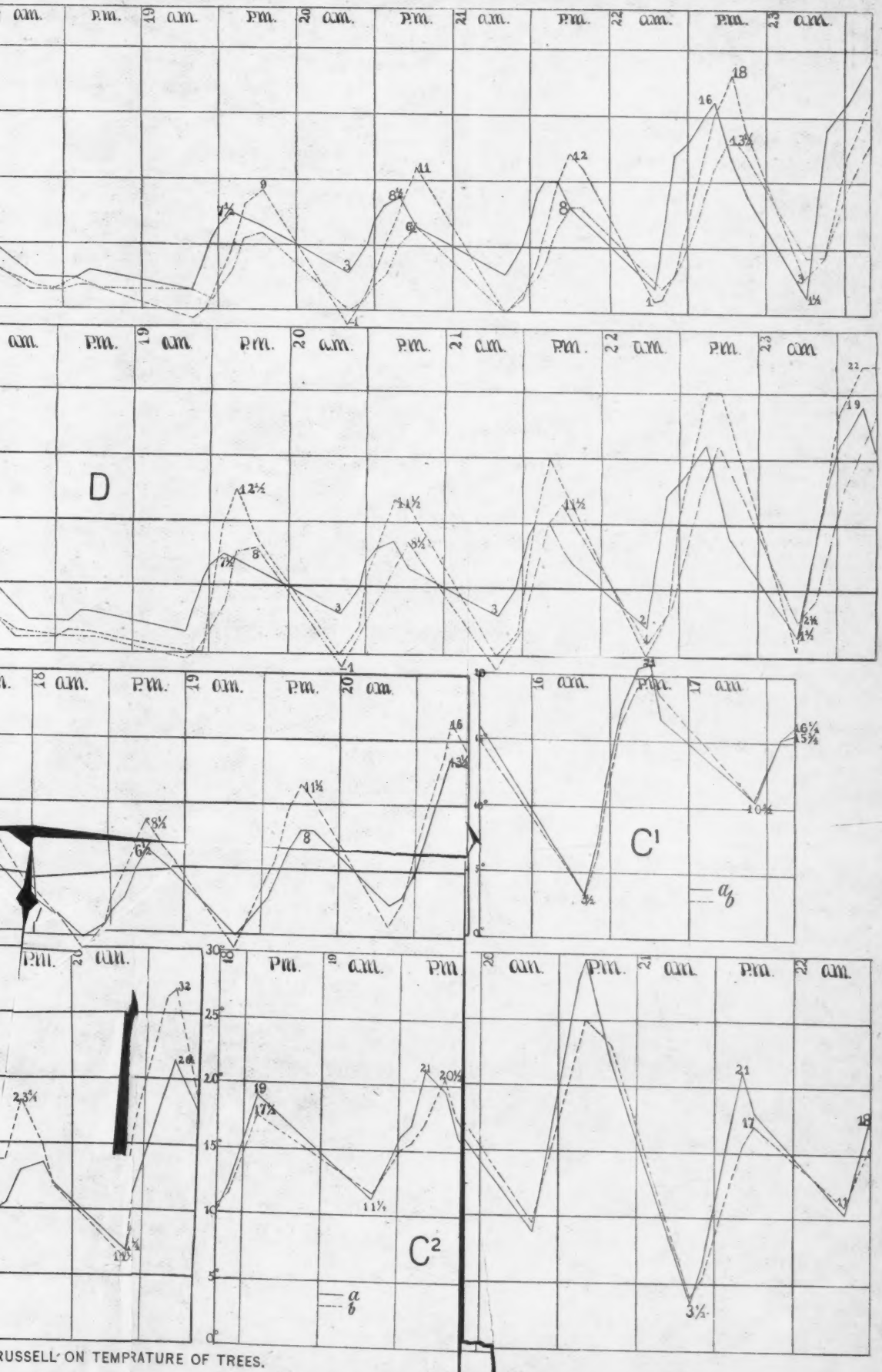
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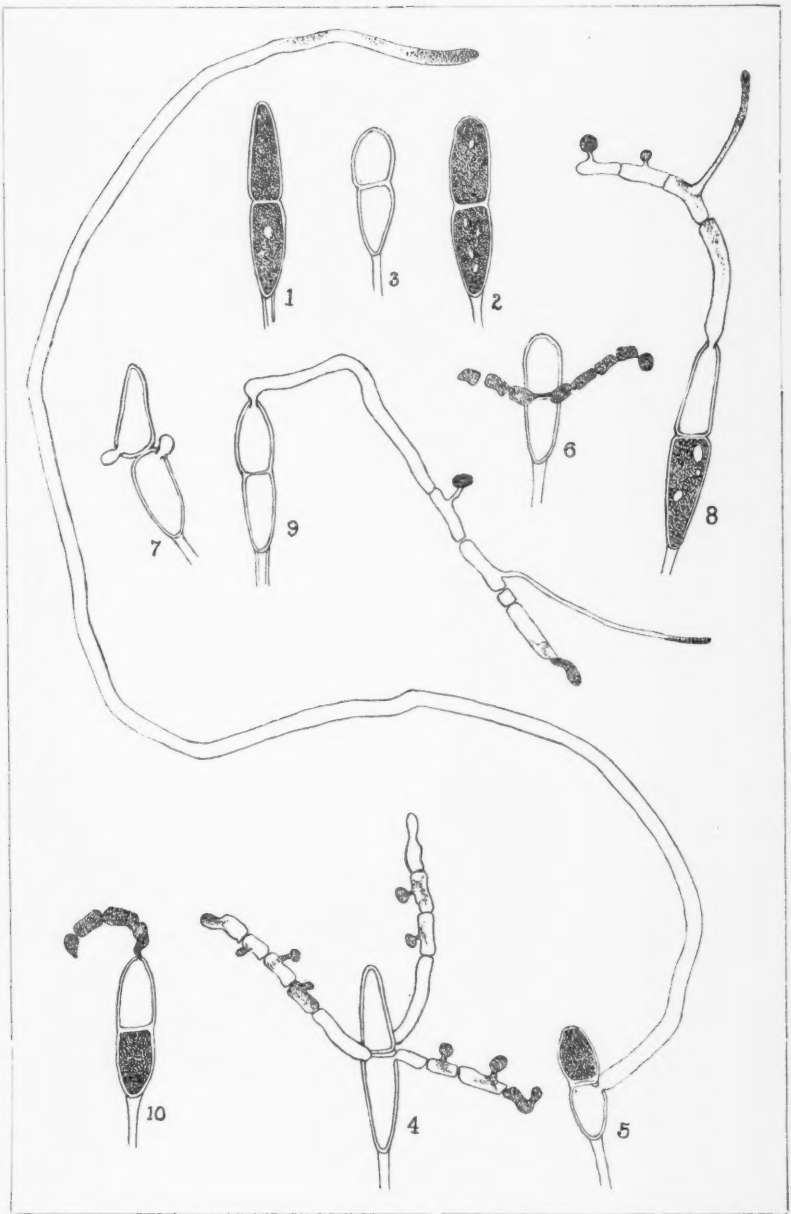

RICHARDS on GYMNOSPORANGIUM.